

## WHAT IS CLAIMED IS:

1. A thin film magnetic head comprising:  
an insulating gap layer provided between cores  
made of a magnetic material; and  
5 a coil for inducing a recording magnetic field  
in the cores,  
wherein the gap layer comprises a SiON film.
2. A thin film magnetic head according to Claim 1,  
wherein the Young's modulus E of the gap layer is  $E > 10 123.2$  (GPa).
3. A thin film magnetic head according to Claim 2,  
wherein the atomic ratio of N of the SiON film is 0 (at%)  
 $< N$  atomic %  $\leq 6$  (at%).
4. A thin film magnetic head according to Claim 2,  
15 wherein the Young's modulus E of the gap layer is  $E \geq 127.4$  (GPa).
5. A thin film magnetic head according to Claim 4,  
wherein the atomic ratio of N of the SiON film is 1 (at%)  
 $\leq N$  atomic %  $\leq 6$  (at%).
- 20 6. A thin film magnetic head comprising:  
an insulating gap layer between cores made of a  
magnetic material; and  
a coil for inducing a recording magnetic field  
in the cores,  
25 wherein the gap layer comprises a SiO<sub>2</sub> film,  
and  
wherein the Young's modulus E of the gap layer  
is  $E > 123.2$  (GPa).

7. A thin film magnetic head according to Claim 6,  
wherein the Young's modulus E of the gap layer is  $E \geq 127.4$  (GPa).

5 8. A thin film magnetic head comprising:  
a magnetoresistive element capable of detecting  
a recording signal due to a change in electric resistance  
with an external magnetic field; and  
shield layers formed above and below the  
10 magnetoresistive element with gap layers provided  
therebetween,  
wherein at least one of the gap layers  
comprises a SiON film.

15 9. A thin film magnetic head according to Claim 8,  
wherein the Young's modulus E of at least one of the gap  
layers is  $E > 123.2$  (GPa).

10. A thin film magnetic head according to Claim 9,  
wherein the atomic ratio of N of the SiON film is 0 (at%)  
 $< N$  atomic %  $\leq 6$  (at%).

20 11. A thin film magnetic head according to Claim 9,  
wherein the Young's modulus E of the gap layers is  $E \geq 127.4$  (GPa).

25 12. A thin film magnetic head according to Claim  
11, wherein the atomic ratio of N of the SiON film is 1  
(at%)  $\leq N$  atomic %  $\leq 6$  (at%).

13. A thin film magnetic head comprising:

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a magnetoresistive element capable of detecting a recording signal due to a change in electric resistance with an external magnetic field; and

5 shield layers formed above and below the magnetoresistive element with gap layers provided therebetween,

wherein at least one of the gap layers comprises a  $\text{SiO}_2$  film, and

10 wherein the Young's modulus  $E$  of at least one of the gap layers is  $E > 123.2$  (GPa).

14. A thin film magnetic head according to Claim 13, wherein the Young's modulus E of at least one of the gap layers is  $E \geq 127.4$  (GPa).

15. A method of manufacturing a thin film magnetic head comprising:

arranging a target and a substrate opposite to the target in a deposition apparatus; and

forming a gap layer of the thin film magnetic head,

20 wherein in forming the gap layer, a target composed of  $\text{SiO}_2$  is prepared, and then sputtered with  $\text{N}_2$  gas used as a sputtering gas flowing into the apparatus to form the gap layer comprising a  $\text{SiON}$  film.

16. A method of manufacturing a thin film magnetic  
25 head according to Claim 15, wherein the flow rate ratio  
of the N<sub>2</sub> gas in the sputtering gas is 0% < flow rate  
ratio of N<sub>2</sub> gas ≤ 30%.

17. A method of manufacturing a thin film magnetic head according to Claim 16, wherein the flow rate ratio

of the N<sub>2</sub> gas is preferably in the range of 5% ≤ flow rate ratio of N<sub>2</sub> gas ≤ 30%.

18. A method of manufacturing a thin film magnetic head according to Claim 15, wherein forming the gap 5 layer, comprises supplying a bias electric power to the substrate side.

19. A method of manufacturing a thin film magnetic head comprising:

10 arranging a target and a substrate opposite to the target in a deposition apparatus; and

15 forming a gap layer of the thin film magnetic head,

wherein in forming the gap layer, the target composed of SiO<sub>2</sub> is prepared and then sputtered with the bias electric power supplied to the substrate to form the gap layer comprising a SiO<sub>2</sub> film having a Young's modulus E of E> 123.2 (GPa).

20 20. A method of manufacturing a thin film magnetic head according to Claim 19, wherein the bias electric power is equal to or greater than 10 W.